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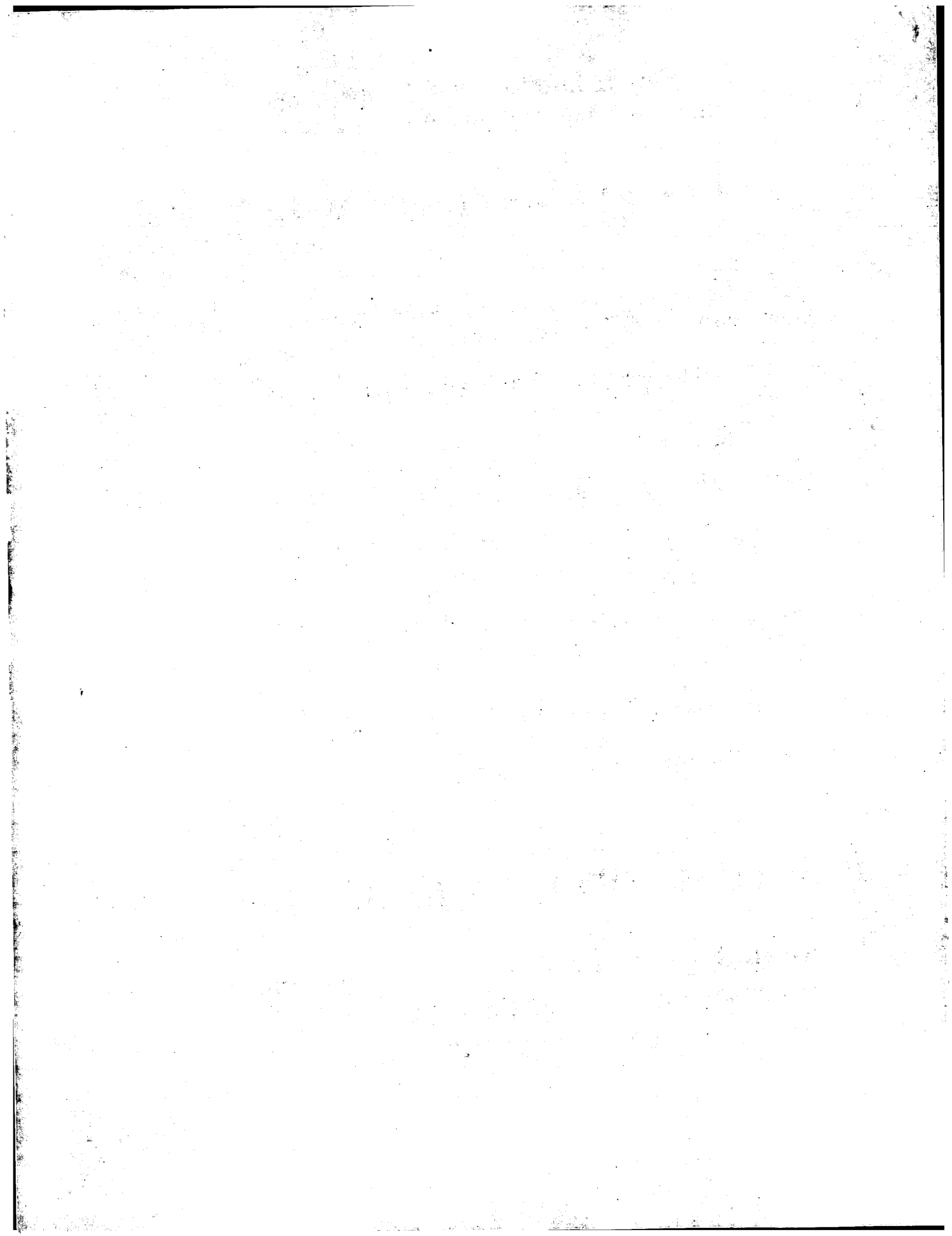
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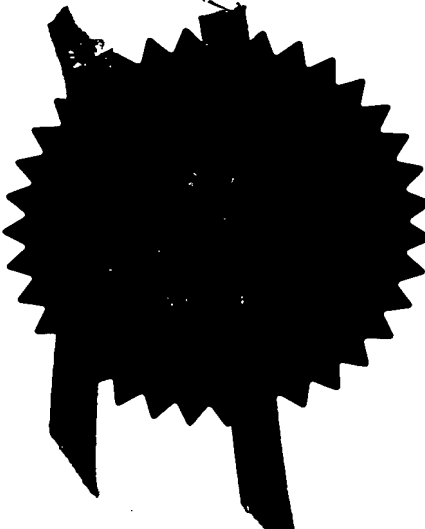
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Signed

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Dated

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United Kingdom

Incorporated in the United Kingdom

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(The Patent Office will fill in this part) **9916045.9**
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LICHFIELD, STAFFS. WS14 0NX.
Patents ADP number (if you know it) 7539802001
If the applicant is a corporate body, give the country/state of its incorporation UNITED KINGDOM
4. Title of the invention LAMINAR MATS AND A METHOD OF PRODUCTION THEREOF
5. Name of your agent (if you have one) Barker Brettell
"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)
138 Hagley Road
Edgbaston
Birmingham
B16 9PW
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Patents Form 1/77

LAMINAR MATS AND A METHOD OF PRODUCTION THEREOF

The invention relates to laminar mats and a method of production thereof. The invention is especially applicable, but not limited to, mats for computer accessories such as a computer mouse. The mats may also be used as table
5 ~~mats or other types of mat for supporting objects on surfaces so as to~~
protect the surfaces.

Mats of the laminar kind are known which are manufactured from a
10 transparent or translucent hard layer of a plastics material, such as PVC of approximately 200 to 400 μm , and an underlying printed layer. The hard layer is usually bonded to a base of foam or other suitable material which provides a non-slip engagement between the mat and a surface on which the
15 mat is supported for use. The hard layer confers a degree of rigidity to the mat and protects against damage to the surface of the mat by, for example, scuffs or dents. The relatively thick hard layer can, however, diffract light from the printed image and reduce the brightness of the print underneath. This, of course, reduces the effect of advertising on the mat.

20 An alternative form of mat includes a thinner upper layer (12 to 70 μm) of scuff-resistant, transparent plastic such as polypropylene (PP) bonded to an underlayer of (e.g. 200 gsm) printed paper. The combined layer is then bonded to a foam backing. The thinner transparent layer reduces the diffractive effect, but reduces the rigidity of the mat, causing it to have a
25 cheaper feel and be more susceptible to damage. The mat therefore has a relatively short useful life before it needs to be replaced.

During manufacture of conventional mats, the laminated upper layer is fixed by adhesive to a lower backing layer of foam material, and the mat is cut to
30 shape. The cutting of the laminated upper layer leaves a sharp rough edge

on the upper perimeter of the mat. This edge can be uncomfortable for the hands and the wrists of those using the mouse mat.

5 There is a need in the art therefore for a mat of sufficient rigidity to withstand wear and tear and protect any underlying decorative, advertising or other print, but allow underlying printed matter to be clearly visible.

Furthermore, a mat of relatively slimline design to reduce costs and a mat provided with a smooth, more rounded edge portion is desirable. There is a further need for a mat which can be manufactured cheaply and quickly and
10 which allows efficient attachment of foam or other non-slip backing material to the mat.

According to a first aspect of the invention, a laminar mat comprises a planar tile of moulded plastics material and, located at each of the upper
15 and lower surfaces of the tile, a planar layer which is fixed to the tile during moulding of the tile so that each layer is integral with the tile, the planar layers of the upper and lower surfaces being of similar material.

Advertising logos or other printed matter may be printed on one or both of
20 the planar layers.

Preferably, the planar layers are of a plastics material, such as polypropylene (PP) or oriented polypropylene (OPP). Additionally, or alternatively, the layers may be of paper or card.

25

The planar layers may be of laminar construction. The layers may include a layer of polyester.

The upper and lower layers being of similar material prevents distortion of
30 the tile from moulding, by reinforcing the upper and lower surfaces of the

tile by an equivalent amount. The arrangement also allows the tile to be moulded of low cost plastics material which would otherwise distort when removed from the mould.

- 5 Where the mat is a mat for a computer mouse, the layers may be chosen to be of a suitable plastics material to improve contact between the mat and the ball of the mouse, and between the mat and the work surface on which the mat is placed.
-

- 10 Either or both of the upper and lower planar layers may be covered with a suitable coat which has one of, or a plurality of;
 high grip properties; anti-static properties; non-slip properties;
 for example to prevent the mat moving relative to the floor or work surface on which it is placed.

15

The layers may be relatively thin, for example a 30 μm thick layer of PVC orientated polypropylene (OPP) as rigidity is provided by the moulded plastics tile.

- 20 The planar layers protect the mat from wear and tear such as scuffing and protect applied printed matter thereunder. Advantageously, the mat can be manufactured to have a relatively slimline construction whilst maintaining strength and rigidity. The planar layers are sufficiently thin to give minimum light diffraction.

25

The upper planar layer of the mat may be textured in the mould in which the tile is moulded, part of the mould being suitably formed to provide the desired texturing. The pressure of the plastics material in the mould against the intended upper layer of the completed mat during moulding of the tile

causes the layer to be formed with the textured features of the part of the mould.

5 The lower planar layer may be textured in the mould, for example by having ridges, protrusions, or dimples, so as to improve friction between the mat and the underlying surface on which it is supported for use. As with the textured upper planar layer just described, part of the mould may be suitably formed to provide the desired texturing.

10 Where the mat is, for example, a mat for a computer mouse, its edges are preferably rounded down from the upper surface to provide a comfortable periphery to the mat for the user of the mouse.

15 In a further embodiment, the mat may include a thicker non-slip backing material. For that purpose the lower planar layer may include, on its outer surface, heat activated adhesive means whereby the backing material is fixed to the underside of the mat. Use of such adhesive means allows the mat to be aligned correctly on the non-slip backing material before the adhesive is activated by a heating step, during the mat's manufacture, which
20 bonds the backing material to the mat.

The lower layer may comprise a laminate, preferably of at least three laminae, for example:

- a first lamina fixed at one side to the planar tile;
- 25 a second lamina of aluminium foil bonded to the opposite side of the first lamina; and
- a lamina of heat sensitive adhesive fixed to the external face of the aluminium foil.

Any suitable type of backing material may be applied to be fixed to the lower layer by the heat activated adhesive means.

The mat may include decorative effects such as, but not limited to, metalisation effects, holograms, and lenticular surfaces. The decorative effects are printed on the planar layer or layers, as desired.

According to a second aspect of the invention, a method of manufacturing a laminar mat comprises inserting at least two planar layers of similar material into a mould at opposed surfaces thereof, filling the mould with a molten plastics material between the planar layers and allowing the plastics material to set to produce a planar tile with said planar layers bonded to opposite surfaces thereof.

The method preferably has a single moulding step and produces laminar mats of relatively slimline construction with each constituent layer being produced at its effective minimum available production thickness. This allows the mat to be produced economically and quickly as the mat is in a finished state upon leaving the mould.

The method preferably includes the use of multi-impression tooling to mould a plurality of mats in a single moulding operation.

The method may further comprise the steps of:

including on one layer of the mat, heat-activated adhesive means on a lamina of heat conductive material so that, the moulded mat includes a heat-activated adhesive means;

after removing the moulded tile from the mould, positioning backing material on said one layer of the tile using alignment means to align the tile and backing material; and

passing the mat and aligned backing material under an induction head which causes the heat-conductive lamina to heat-activate the adhesive, bonding the said one layer of the mat to the backing material.

- 5 The heat conductive lamina is preferably aluminium foil.
-

The alignment means preferably comprises a formed edge of the mat which positively locates the backing material correctly with respect to the said one layer of the tile before the adhesive is heat activated to bond that layer to
10 the backing material.

Pressure may be applied to the opposite layer of the tile during the heat activation of the adhesive. The moulded mat may be removed from the mould by robotic means.

15

The mould may include parts to allow texturing to be applied to one or both of the layers.

There now follows by way of example only a detailed description of the two
20 embodiments of the invention with reference to the accompanying drawings of which:

Figure 1a shows in transverse cross section a mouse mat according to one embodiment of the invention;

25

Figure 1b shows in transverse cross section an exploded view A of the mouse mat of Figure 1a;

Figure 2a shows in transverse cross section a mouse mat according to a
30 further embodiment of the invention; and

Figure 2b shows in transverse cross section an exploded view B of the mouse mat of Figure 2a.

In Figure 1 the mat 1 comprises a moulded planar tile 2 of polypropylene.

- 5 The tile 1 is, typically, approximately 1 mm thick. Before moulding of the tile, ~~upper and lower planar layers 3, 4 are positioned in the mould against~~
 opposed surfaces thereof so that, when the mat is subsequently moulded in the mould, the layers 3, 4 are respectively fixed integrally to opposite, upper and lower, surfaces of the tile. Dimples are moulded in the lower surface of
 10 the tile which produce corresponding dimples 5 in the lower layer 4 fixed to that surface. The dimples 5 assist in improving friction between the mat and an underlying surface on which it may be supported for use.

- The layers 3, 4 each comprise a laminated structure of 3 sub-layers: a
 15 lamina of oriented polypropylene (OPP) 6, typically 30 μm thick, closest to the surface of the tile, and a printed lamina 7 on the underside of a third lamina 8 of oriented polypropylene (OPP), typically 20 μm thick. As an alternative to the OPP, a lamina of paper, for example 100gsm, may be used, as it is easier to print on the paper than it is on the OPP lamina.

20

- The rigidity of the mat is conferred by the plastics material of the tile 2, reinforced against bending or other distortion of the plastics material after moulding by virtue of the layers 3, 4 on its upper and lower surfaces. The layers offer a scuff-resistant cover to the surfaces of the mat and are
 25 generally transparent so that underlying print is clearly visible through the layers. In the mat shown, the tile, and thus the upper layer 3, has its edges rounded down from the upper surface to the lower surface to improve comfort for the user of the mat.

The upper layer 3 is of the same construction as the lower layer 4 which doubles the available printing space on the mat. The outermost lamina of each layer can be selected to be of a suitable material to improve contact with the mouse ball or underlying surface. Alternatively, the layer may be coated with a suitable coat 9 conferring improved contact with the mouse ball or underlying surface

Texturing (not shown) may be applied to the upper layer 3 by a suitably textured part of the mould. The texturing may improve contact with the mouse ball, incorporate advertising and/or improve the decorative appearance of the mat.

The lower layer 4 is evenly covered with the dimples 5 to improve friction between the mat and the underlying surface, such as a table top, on which the mat is supported for use.

A further embodiment of the mat according to the invention is shown in Figure 2. The mat has a foam backing 10 to improve the grip of the mat on a supporting underlying surface. The foam backing 10 is attached to the lower layer of the mat after moulding of the plastics tile. In this embodiment the mat has an arcuately down-turned peripheral edge 13 so that it is of a shallow inverted tray form. This rebated edge is more comfortable for the user as it presents a contoured smooth surface.

The lower layer 4 of the mat comprises an OPP lamina 6, typically 30 μm thick, followed by an aluminium foil lamina 11, typically 7 μm thick, with a heat-activated adhesive lamina 12 attached thereto. After the mat has been removed, conveniently robotically, from the mould, a layer of backing foam 10, typically 3mm thick, is placed on the heat sensitive layer using the down-turned edge 13 of the mat to locate the foam accurately with respect

to the mat within the confines of the edge. The aligned tile and backing foam 10 is passed under an induction head to heat the aluminium foil and activate the heat-activated adhesive which bonds the backing foam 10 to the mat 1.

5

~~No adhesive spreads to the surrounding, overlapping edge of the mat during~~
fixing of the foam backing to the mat, as the laminae and backing are held in a fixed position relative to each other during heat-activation of the adhesive.

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FIG 1a

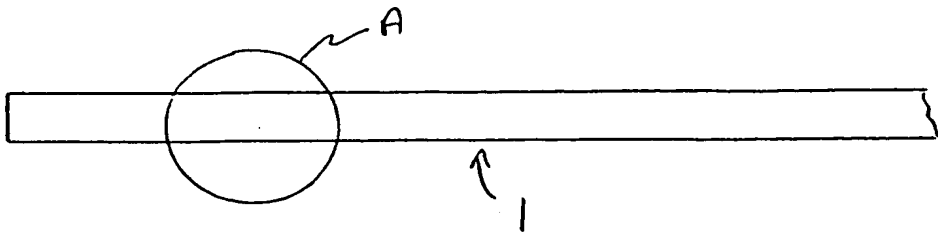
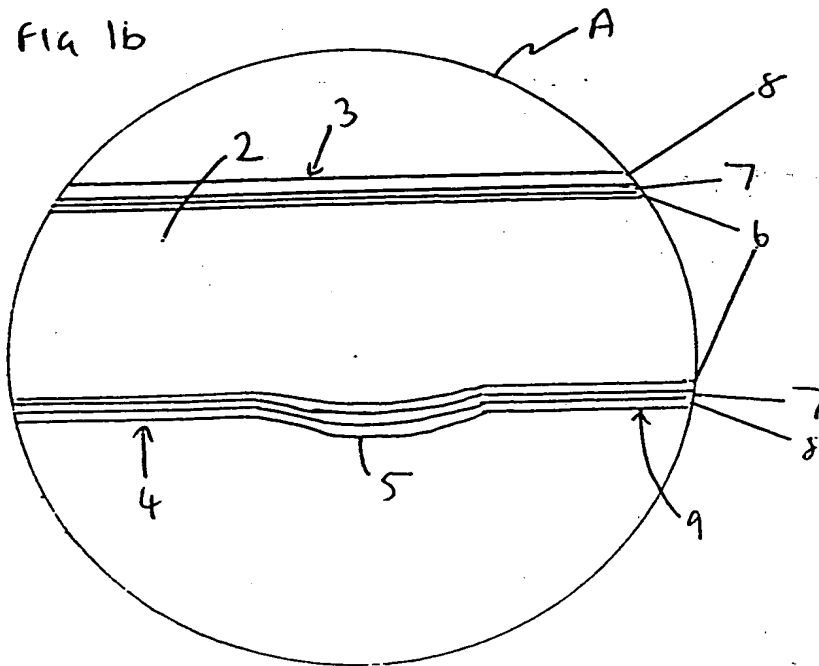


FIG 1b



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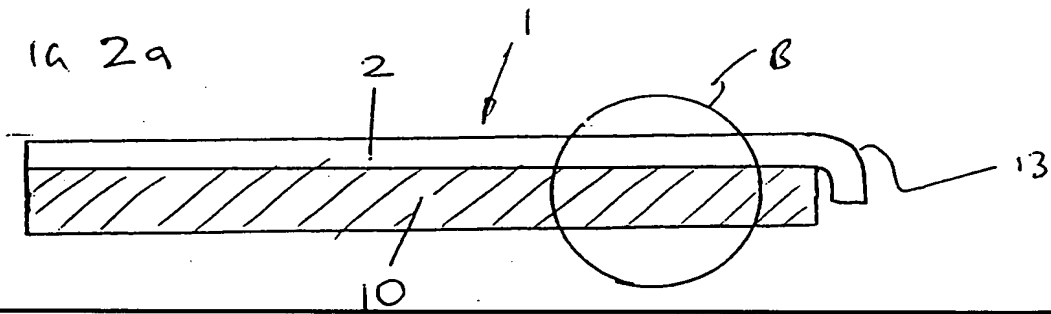
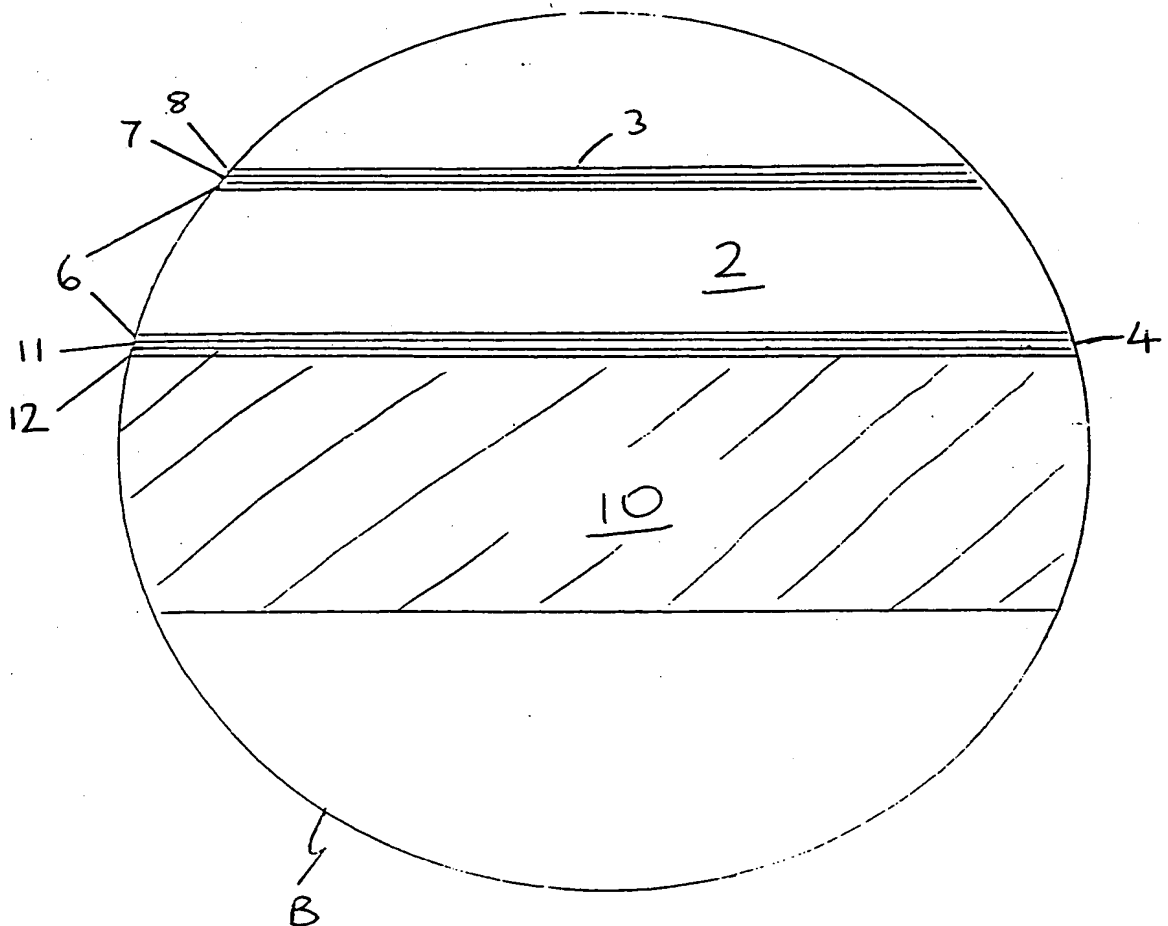


Fig 2b



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